For release: 9:20 a.m. Friday, June 11, 1971

Ohio State University
Columbus, Ohio

June 11, 1971

COMMENCEMENT ADDRESS

by

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It gives me particular pleasure to join with you here at the Graduation of the Class of 1971. You have been students at this University during a period of tremendous ferment . . . a time of change and challenge . . . of discovery and continued search. It has been a time of paradox. We have been witness to triumph and tragedy . . . to events that have intensified both our fears and our hopes. It has been a time when man's abilities and his shortcomings have been manifestly evident.

Once a priest in a small Latin American village, hoping to encourage his congregation to extend themselves in the support of the tiny church, placed ten pesos in the collection box before mass. Although the congregation was small, the priest was optimistic that this example would encourage a generous response from his parish. After the service, he bade farewell to each of the departing villagers, then hopefully inspected the box to collect the offerings his church needed so badly. He found only the ten pesos he had deposited an hour before. A small boy, who had watched the entire process observed with simple truth -- "Padre, if you had put more in, you would have got more out."

Today, this graduating class receives their diplomas. But each individual knows that this parchment is not a payment or reward, but merely a measure of his investment. You each recognize that you may not demand, in terms of real values, to "get more out" than "you have put in." Occasionally, however, the return on one's efforts is far greater than the input. The more or less "accidental" discovery of the X-ray by Roentgen certainly led to applications beyond the wildest dreams of any researcher. Michaelson's finding that the speed of light was independent of the velocity of the measurer led to a revolution in physics. When NASA's C. B. Cone was studying radiation effects on cells in order to understand possible space radiation effects on astronauts, he discovered that the electrical voltage across the surface membrane of a normal cell acts to exert precise control over cell division. This implies that it is an alteration in the molecular structure of the cell surface that permits the uncontrolled proliferation and metastasis characterizing cancer. This new theory has opened a promising new avenue for possible control of cancer.

Does this mean that the public should support the space program and other research efforts based on the justification of a predictable measure of "serendipity"?

Certainly not. Neither should it fail to recognize the implications of its successes.

Space flight has proved to be a significant new mode of transportation in a wholly different environment. It is an important and powerful capability being added to our national resources in which it is imperative to develop and maintain a proficiency. Simple prudence demands that we do so. For as men become more experienced in space flight, the opportunities for enterprise and usefulness will grow as our vision grows.

From a condition of utter lack of utility in 1903, for example, the airplane evolved into today's inter-continental transport systems making it possible for millions of travelers and business men to visit other lands and people, causing enormous impact on our concepts, living habits, and the economies of nations. The income of the average air traveler in this country is less than $12,000 -- far from the "jet-set" image portrayed by some contemporary observers. U.S. airlines are currently accumulating about 130 billion passenger miles per year.

Not the slightest inkling of this future development of air transport, however, was apparent when the Wright Brothers of Dayton first flew. Indeed, that famous

scientist, Simon Newcomb, had given a paper before a learned society not long before the flight which proved conclusively that heavier-than-air machines could not possibly fly. Fortunately, either the Wright Brothers never read, or chose to ignore, Newcomb's intellectual tour de force, for they went ahead and flew their rickety machine anyway.

Today, the United States cannot afford to neglect, as it did the airplane in the early days of aeronautics, a technology so powerful in its potential as manned space flight. Any technology that can take man to the moon and back less than ten years after the first pioneering orbit of earth is not a toy to be lightly cast aside when our attention is distracted by other matters. Manned space flight, the art of mastering the prime forces of the universe, in an arena vast beyond imagination, ought to be judged for what it is: an enormously powerful and versatile new capability of immense consequence to all mankind -- too great for us to ignore or downgrade its significance for the future. A nation's, as well as an individual's, true wealth is measured by the capabilities, not the material possessions it may accumulate. Spacefaring, just as seafaring and aeronautics did earlier in history, is moving forward on the stage of human affairs, adding a new dimension to our economic, cultural and spiritual potential.

My enthusiasm for the future of space travel, I think you'll grant, is understandable. To stand on the surface of the moon and look at the earth high over head leaves an impression not easily forgotten. Although our blue planet is very beautiful, it is very remote and apparently very small. You might suspect that in such a situation, the observer might dismiss the earth as relatively unimportant. However, exactly the opposite conclusion has been reached by each of the individuals who has had the opportunity to share that view. We have all been struck by the simile to an oasis or an island. More importantly, it is the ONLY island that we know is a suitable home for man.

I suspect that it is more than an accident that a phenomenal increase in awareness of the importance of ecology, conservation and pollution control have characterized the years since the flight of Apollo 8 on Christmans of 1968 . . . when man got his first view of his planet from afar. The importance of protecting that planet has become an international concern. Protection seems most required, however, not from invading aggressors or natural calamity, but from its own population.

The human race is using about two acres of land per person, one in cultivation of food crops, the other for the raising of domestic animals. This usage provides a

nutritional level adequate for one-half the world's population leaving the remaining half undernourished.

At the United Nations median population growth rate (probably a reasonable estimate) and assuming no change to the average nutritional level, the entire remainder of all arable land on the earth's surface will be in use at the end of this century. There is NO escape from the tremendous competitive pressures for the use of the remaining land that this fact dictates.

The accompanying demand for natural resources and the voracious appetite for energy conversion will compound the problem. Perhaps social, political, and attitudinal change will improve our future. In the meantime, technology must be called on to bridge the gap. Harvesting the sea, converting petroleum into protein, and developing pollution-free nuclear fusion energy sources show promise of favorable and major impacts on our well-being. Paradoxically, while technology is being called on for help, it is under attack for its morality. It has been accused of complete indifference or even studied destruction of this planet and its inhabitants. Although I reject the charges of deliberate maliciousness, I would agree that the technological community has been as apathetic as the average society

member in concern with the over-all consequences of his actions. The photographs of earth from space, however, have focused the attention of all men on this planet and its treatment.

There are no easy solutions to these problems. As the world gains a clearer understanding of what "environmental conservation" and "improving the quality of life" mean in terms of the sacrifices that will be demanded of everyone, high or low, rich or poor, affecting traditional freedoms of choice, physical comforts, and diminishing opportunity, a very massive issue will develop.

The very success of the human species over eons of time now threatens our extinction, and it is the drives that made for such success that now must be curbed, redirected, or released by expansion into a new world ecology. It is extremely doubtful that mankind can be stabilized and held permanently in check at any given population level, at any given standard of living, in a world of decreasing natural resources. The political clout needed to accomplish this iron control staggers the imagination and credulity.

The complexity of achieving the proper balance between solving today's needs and preparing for tomorrow's

promises is continually facing every segment of human life. A corporation must concern itself with the stockholders interest in today's balance sheet but also prepare for the changes and needs of the future. Many members of this graduating class are now faced with choosing between a job selected for immediate practical benefits or continued study directed toward better preparing for the career goals.

These difficult choices are not only facing students, businessmen, professionals and politicians, they are the challenges of nations . . . and, in fact, the entire human race. We must continually seek that balance that properly divides out energies between solution of the problems of today and prevention of the problems of tomorrow.

I have had the privilege of working within a segment of society that is dedicated to the broadening of man's horizons. This spring marks the tenth birthday of manned space flight . . . still an infant transportation system.

The first decade of space flight was a time of exploration. The next decade will likely be a time of application. Emphasis will be placed on how to reap the benefits from our new-found knowledge. This is consistent

with the general contemporary tendency in our nation to turn inward and concentrate on human needs and creature comforts. Our space investments are being called on to emphasize the applications of this new technology to serve our people. And this is very appropriate. I do hope, however, that we will continue to explore our universe.

Arthur Clarke, the noted British author, said, "The road to the stars has been discovered none too soon. Civilization cannot exist without new frontiers. It needs them both physically and spiritually."

Many historians have noted the relationship between the pioneering response to the opening of new frontiers and the vigor and confidence of a nation.

Vigor and confidence must be strengthened if we are to maintain our vitality. The challenge to this class is to provide that vigor and confidence. One segment of society advocates "tuning out" and withdrawing to a Proustian cork-walled room, reasoning that if society's problems can't be solved, they can best serve by minimizing their own contributions to those problems.

Problems, to other people, however, are challenges to be met. Few rewards are as gratifying as discovery, particularly

when that discovery is a much needed solution to a perplexing problem.

Although today many of you complete your formal academic career, it will not be the omega of your education. In these dynamic, changing times, yesterday's dream is today a hope . . . and tomorrow a reality. Within our lifetime, I believe we'll see a definite change in our outlook toward education. It will become a continuing process, lasting not just through the graduate and post-graduate levels, but rather through the entire adult life-time. Aldous Huxley said, "Thre's only one corner of the universe that you can be sure of improving, and that's your ownself."

To those of you who will continue into graduate school, I give my hearty congratulations . . . and assurance that the continued development of your talents is important not only to yourself but to the community that you will serve.

To those of you who will leave the halls of ivy and join that community either in industry, military service, business, or professional life, we bid you welcome. We need your help.

Permit me to conclude with a fable. Centuries ago, a wise man was presented with a cruel dilemma. An enemy appeared before him, to discredit him, holding in his hand a small bird. The question put to the wise man was this: Is the bird dead or alive? If the wise man said dead, the bird would be released to fly away. If he said alive, the bird would be crushed and dropped lifeless to the ground. The wise man hesitated a moment and replied: "Sir, the decision is in your hands."

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